

DRAWINGS ATTACHED.

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## COMPLETE SPECIFICATION.

### Improvements in or relating to Vehicle Head-Lamps and Light Sources Therefor.

We, JOACHIM FRIEDRICH DREIER AND ALFRED SENDT, both citizens of the German Federal Republic, of Karlstrasse 5, Gutersloh (Westfalen), Western Germany and Wagenfeldstrasse 36, Munster (Westfalen), Western Germany, respectively, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in vehicle head-lamps and light sources therefor.

It is an object of the present invention to provide an improved vehicle head-lamp and light source therefor in which the glare produced thereby shall be reduced, compared with those previously known, without undue loss of light intensity.

According to the present invention, a light source for a vehicle head-lamp comprising a filament enclosed in an envelope secured to a base member and a light refracting medium composed of pyramidal shaped transparent glass bodies secured to the envelope or to a casing closely surrounding the envelope by means of a low melting point glass with their bases disposed substantially tangentially of the envelope, the apices of said bodies extending away from the filament and disposed in the path of light directed away from the base member, the refracting medium being such as to refract the light incident thereon through an angle of approximately 90°.

Preferably, the deflecting medium largely surrounds the filament apart from a zone free from such a light deflecting medium

and disposed to one side of said path, although, with advantage, two similar zones may be provided on opposite sides of said filament.

The invention also extends to vehicle head-lamps incorporating a light source according to either of the two immediately preceding paragraphs.

The provision of the light deflecting medium has the advantage that the field of view to the sides of the vehicle is illuminated to a width of about 20 metres and also the area immediately in front of the vehicle is illuminated. To the front of the vehicle the field of view up to 60 or 80 metres distance is practically evenly illuminated whereas with the hitherto known head-lamps the illumination of the road ahead with dipped (dimmed) lights reached only 25 or at most 30 metres. Preferably the light-deflecting medium is chosen such that the colour of the light is varied from sharp white towards reddish-yellow, in the direction of longer wavelengths. This gives better visibility especially in fog or mist. The light intensity as compared with the light thrown by hitherto known head-lamps is increased but the illumination intensity will still be below the maximum normally considered to be non-glaring. In the case of the two-filament bulb there is sometimes the disadvantage that the maximum usual input of the lamp, say 35 watts, will not provide a sufficient illumination intensity on the road with dipped headlights. On the average there could be a deficiency of approximately 0.35 lumens on the road with dipped head-lights.

However, by leaving a zone free from the light deflecting medium and disposing the

zone above the filament so that it extends there-around down to approximately the level of the filament, this disadvantage can be largely overcome. In the case of an ordinary two-filament bulb this zone is provided in the path of the effective light rays projected while the head-lamp is in "dipped position".

As a result, with dipped head-lights there will be no substantial difference compared to the usual dipped head-lights in which the filament is screened by a shield, since the light rays from the "dipper" filament will pass through the clear glass zone as in the case of clear glass bulbs and so reach the road through the appropriate (upper) part of the reflector of the head-lamp.

The size and position of the zone determines the size and direction of the emergent beam. It is, of course, not necessary that this zone of clear glass be exactly of the same shape as the surface through which the normal "dipped" light passed in prior bulb constructions, since in the case of the bulb or light-source of the invention there will be additional light given off from the light deflecting medium which will also reach the road.

The screening of the filament for dipped lighting by means of a shield is not necessary since by the refraction or deflection of the light by the light deflecting medium the glare effect is eliminated.

Also the illumination of the road by the long or main beam is improved by the proposed invention as compared with the illumination obtained by screening of the filament for dipped lighting. Owing to the usual difference in the disposition of the close or dipped lighting filament and the distance or main lighting filament in relation to the focus of the reflector mirror of the head-lamp, it follows that the rays from the main beam filament passing through the zone and reaching the reflector will be projected horizontally forward whilst the rays from the dipped filament passing through the clear glass zone to the reflector will be projected from the head-lamp at the usual downward angle. It has been found that there is no disturbing increase in the glare as is the case with head-lamps of prior constructions.

To obtain a somewhat brighter illumination of the right half of the road the zone on the left side of the bulb or light source is desirably enlarged to extend below the horizontal plane through the incandescent filament. Alternatively an additional area of clear glass can be provided at the side of the lamp. In both cases the light from the filaments will pass out sideways undeflected on the left side of the reflector whence it will pass mainly towards the right. In this manner the right hand side of the

road will be fully illuminated and to a level which lies above a horizontal plane passing through the filament. The effect of this device approximates that of other known devices for producing "asymmetric" illumination. This facilitates recognition of traffic signs and other objects to the right of the road without dazzling oncoming motorists.

The improved light source can also be used with advantage in head-lamps of the existing type which include three bulbs that can be switched on separately or in combination. This type of head-lamp contains in addition to the parking light bulb, separate bulbs for dipped and for long-beam lighting. The use of the improved bulb of the invention in such head-lamps would involve leaving the long-beam bulb unchanged as a clear glass bulb with its main-beam filament. Besides this long-beam bulb there would be the dipped light bulb with an offset in relation to the focus of the reflector. When using the improved light source of the invention two zones free of light deflecting medium are provided one above and one below the filament. Preferably, the lower zone should be smaller than the upper zone and should be disposed above the filament of the long-beam bulb. By this arrangement the rays from the long-beam bulb can pass through the lower and then through the upper zones to reach the reflector from where they will be reflected in the usual manner. With this type of head-light there will be no glare when using the improved "dipper" bulb; it is avoided by the asymmetric arrangement.

When using the improved three bulb assembly an ideal long-beam light is provided when the "dipper" and long-beam bulbs are switched on together, for besides the long-beam lighting there will also be a very good, and by comparison with present lighting much improved, illumination in width of beam near the vehicle.

Further details and advantages of the invention will become apparent from the following description together with the drawings, in which:—

Figure 1 is a side elevational view, partly in section, of an improved light source or bulb according to the invention;

Figure 2 is a similar view showing a lamp reflector with the improved bulb in combination with separate bulbs for parking and long-beam lighting; and

Figure 3 is a sectional view of a modified form of the invention employing a clear glass bulb and a separate external casing.

Referring first to Figure 1 the improved bulb of this example comprises a pear-shaped glass bulb 2 fixed on a base 1. This glass bulb is provided on its outer surface with transparent light-deflecting bodies 3, as described below. It is, of course, also pos-

sible to place these transparent light-deflecting bodies not directly on the glass bulb but on a separate enclosure some distance from the bulb. At the side of the glass bulb, above the filaments 5 and 6, there is provided a substantially diamond-shaped zone extending down each side of the bulb to approximately the level of a horizontal plane through the filaments, this zone being of clear glass and free of any light-deflecting medium. The dipper filament is marked with the reference number 5 and the long-beam filament with the reference number 6.

For use in right-hand traffic, for the better illumination of the right side of the road, there is on the left side of the bulb, somewhat below the point of the zone 4, an additional clear space 7 of substantially elliptical shape through which the additional asymmetric illumination of the right-hand half of the road is secured as earlier described, this space 7 being in effect an enlargement of the zone 4.

In countries with left-hand traffic this clear space can be located correspondingly on the other side of the bulb.

In the example shown in Figure 2 a reflector R is fitted with a mounting element 8 attached to the base of the reflector and which serves to accommodate the different bulbs. The bulb 9 is a parking light bulb, bulb 10 is a normal long-beam bulb of clear glass with only one incandescent filament 11 for the long-beam. The other bulb 12 corresponds to that described with reference to Figure 1. It consists of a clear glass envelope coated with transparent light-deflecting bodies 13. On its upper side there is a zone 14 of clear glass corresponding approximately to the zone 4 already described. The "asymmetric" enlargement 7 is not shown. Also, for the sake of simplicity, the dipper filament is not shown. A zone 15, similar to the zone 14, but smaller, is provided on the underside of the bulb with its ends terminating at approximately the level of the dipper filament and spaced a short distance from the corresponding ends of the zone 14. With this arrangement the long-beam rays from incandescent filament 11 can also reach the upper part of the reflector. The effect in regard to the dipper light has already been described.

Owing to the displacement of the dipper bulb out of the focus line of the reflector, the light rays passing through the zone 15 will be so reflected by the reflector R that they will not be disturbed by the presence of bulb 12.

By covering the glass bulb or a casing surrounding the glass bulb with the transparent light-deflecting bodies 3 or 13 no screening shield for the dipper light filament is necessary. In neither of the drawings, therefore, is such a shield shown.

To be able to use the invention with conventional clear glass bulbs it is possible to fit them with a preferably split casing as shown in Figure 3. The lower part 16 of the casing has a neck 17 of clear glass and can be drawn over the bulb base 1 close up to the glass bulb 2. The lower part of the casing 16 is held in place by the lamp socket into which the bulb is fitted. On this lower part towards the front a cap 18 is fixed and secured at the joint 21 by means of cementing, glueing or a threaded screw connection. The upper part 18 is provided with a screen 19 of a light deflecting medium. The lower part 16 is also provided with a screen 20 of a light deflecting medium and a zone 16a of clear glass is provided corresponding to the zone 4 in Figure 1 or the combination of zone 4 with the asymmetric clear space 7.

As shown in Figure 1 the outer surface of the clear glass bulb 2 or 12 (Figure 2) is covered with transparent light-deflecting bodies, except at the segment 4, 14 or 15 and the additional clear space of elliptical shape.

These light-deflecting bodies 3 are of a transparent material, preferably of glass, having been ground in a mill, e.g. a roller-mill, to produce particles of pyramidal shape. These particles may be sifted or winnowed to collect those having a size of 1 to 2 mm, preferably however 1 mm or less. These pyramidal particles are secured to the clear glass bulb by means of a suitable binder, e.g. glass having a low melting point.

The pyramidal particles are positioned on the clear glass bulb such that they are in contact by their base with the surface of the bulb so that their apices are pointing radially outwards.

#### WHAT WE CLAIM IS:—

1. A light source for a vehicle head-lamp comprising a filament enclosed in an envelope secured to a base member and a light-refracting medium composed of pyramidal shaped transparent glass bodies secured to the envelope or to a casing closely surrounding the envelope by means of a low melting point glass with their bases disposed substantially tangentially of the envelope, the apices of said bodies extending away from the filament and disposed in the path of light directed away from the base member, the refracting medium being such as to refract the light incident thereon through an angle of approximately 90°.

2. A light source according to Claim 1, wherein pyramidal bodies are of a size of from 1 to 2 mm, preferably 1 mm.

3. A light source according to Claim 1 or Claim 2 wherein the casing is attached to the base member.

4. A light source according to any one of the preceding claims wherein the deflecting medium largely surrounds the filament apart from a zone free from such a light deflecting medium and disposed to one side of said path.
5. A light source according to Claim 4 wherein said zone extends around the filament to terminate at locations on substantially diametrically opposed sides of the filament, the diameter being substantially normal to said path.
6. A light source according to Claim 5 wherein said zone is substantially diamond shaped.
7. A light source according to Claim 6 wherein the diamond shaped zone is enlarged at at least one of the diametrically opposed sides of the filament.
8. A light source according to Claim 7 wherein the enlargement is of substantially elliptical shape.
9. A light source according to Claim 7 or 8 wherein the enlargement is provided on both of the diametrically opposed sides of the filament.
10. A light source according to any one of Claims 4 to 9 wherein two similar zones are provided on opposite sides of said filament.
11. A light source for a vehicle head-lamp constructed, arranged and adapted to operate substantially as herein described with reference to Figure 1, 2 or 3 of the accompanying drawings.
12. A vehicle head-lamp embodying a light source according to any one of the preceding claims.
13. A vehicle head-lamp embodying a light source according to any one of Claims 4 to 9 wherein said zone is arranged to be disposed above said filament.
14. A vehicle head-lamp according to Claim 13 and Claim 7, 8, 9 or 10 wherein the or each enlargement is one disposed substantially level with the filament.
15. A vehicle head-lamp according to Claim 13 or 14 including a light bulb placed at the focus of a reflector for producing a main beam with said light source displaced from the focus to produce a dipped beam and arranged to permit light from said light bulb to pass through said similar zones of said light source to said reflector.
16. A vehicle head-lamp according to any one of Claims 12 to 15 including a parking lamp bulb.
17. A vehicle head-lamp constructed, arranged and adapted to operate substantially as herein described with reference to Figure 2 of the accompanying drawings.

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